

What is claimed is:

1. A rotary die apparatus comprising:

a base;

a plurality of elongate columns, each column having a first end and a second end defining a first axis of movement along a length thereof, the first end of each column removably mounted to the base in spaced relationship to one another;

at least one cross member moveably engaged with respect to at least two of the plurality of columns for movement along the first axis;

at least one first modular die support removably mounted to the base;

at least one second modular die support removably mounted to the cross member; and

at least one die having an axis of rotation, the die positioned between the base and the cross member in rolling engagement with at least one of the first and the second modular die supports.

2. The apparatus of claim 1 wherein the at least one die further comprises:

a first rotary die having a first axis of rotation, the first die in rolling engagement with the first modular die support; and

a second rotary die having a second axis of rotation, the second die in rolling engagement with the second modular die support, the second die positioned with the second axis of rotation in substantially parallel alignment to the first axis of rotation of the first die.

3. The apparatus of claim 2 wherein the first die is in rolling engagement with the second die.

4. The apparatus of claim 3 wherein the first rotary die further comprises a first end surface and an opposing second end surface, the first die having a radially raised flange adjacent to at least one of the first and the second end surfaces.

5. The apparatus of claim 4 wherein the raised flange operably engages the first modular die support to limit linear translation of the first die along the first axis of rotation.

6. The apparatus of claim 4 wherein the raised flange operably engages the second die to limit linear translation of the second die along the second axis of rotation.

7. The apparatus of claim 1 wherein the cross member further comprises a first cross member and a second cross member, the first and second cross members positioned on opposing columns in spaced relationship with respect to one another.

8. The apparatus of claim 1 further comprising a pressure member operably engaged with the cross member for selectively adjusting the position of the cross member along the first axis of movement.

9. The apparatus of claim 1 wherein at least one of the first and the second modular die supports further comprise at least two rollers having axes of rotation substantially parallel to one another and angularly spaced from one another from the axis of rotation.

10. The apparatus of claim 1 wherein the die further comprises a first end surface and an opposing second end surface, the die having an

elongate journal extending from at least one of the first and second end surfaces along the axis of rotation; and

at least one of the first and second modular die supports comprising a cylindrical roller bearing, the roller bearing operably engaged with the journal permitting free rotation of the die about the axis of rotation.

11. The apparatus of claim 10 further comprising at least one spacer positioned between the first and the second modular die supports.

12. A rotary die apparatus comprising:

a frame having a base, a plurality of elongate columns having a first end and a second end defining a first axis of movement along a length thereof, the first ends of the columns removably mounted to the base and the second ends of the columns removably mounted to a cover, at least one cross member moveably engaged with respect to at least two of the plurality of columns for movement along the first axis;

a first rotary die having a first axis of rotation, the first die having a first end surface and an opposing second end surface and at least one raised radial flange adjacent at least one of the first and second end surfaces;

a second rotary die having a second axis of rotation positioned in substantially parallel alignment with the first axis of rotation and in rolling engagement with the first die, the second die in operable engagement with the radial flange of the first die to limit linear translation of the second die along the second axis of rotation;

a first modular die support removably mounted to the base, the first die support having a first bearing member and a second bearing member separated from the first bearing member along the first axis of rotation, the first and second bearing members having at least two rollers having axes of rotations substantially parallel to one another and angularly spaced from one another from the first axis of rotation, at least one of the first and second

bearing members in operable engagement with the raised radial flange to limit movement of a first die along the first axis of rotation; and

a second modular die support removably mounted to the cross member, the second die support having a first bearing and a second bearing member separated from the first bearing member along the second axis of rotation, the first and second bearing members having at least two rollers having axes of rotation substantially parallel to one another and angularly spaced from one another from the second axis of rotation.

13. An improved rotary die apparatus having a base, a plurality of elongate columns extending from the base, a cover opposite the base engaged with the columns, a cross member moveable between the base and the cover, and a pressure member operably engaged with the cover and the cross member for selectively positioning the cross member on the columns, the improvement comprising:

a first modular die support removably mounted to the base in rolling engagement with a first die permitting free rotation of the first die about a first axis of rotation; and

a second modular die support removably mounted to the cross member in rolling engagement with the second die permitting free rotation of the second die about a second axis of rotation.

14. The apparatus of claim 13 wherein the first die further comprises:

a raised radial flange adjacent at least one of a first and a second opposing end of the first die, the radial flange in operable engagement with the first modular die support to limit linear translation of the first die along the first axis of rotation.

15. The apparatus of claim 14 wherein the second die operably engages the radial flange of the first die to limit linear translation of the second die along the second axis of rotation.

16. The apparatus of claim 13 wherein at least one of the first and second modular die supports comprises at least two rollers having axes of rotation substantially parallel to one another and angularly spaced from one another.

17. The apparatus of claim 13 wherein at least one of the first and second modular die supports further comprises at least one cylindrical roller bearing for rolling engagement with a journal on at least one of the first and the second dies.

18. A method of installing a rotary die in a die apparatus, the method comprising:

positioning a die conveyor adjacent a rotary die frame between a base and a cross member separated by a plurality of columns defining a first axis of movement, the conveyor defining a second axis of movement;

moving a rotary die along the second axis of movement to the frame;

supporting the rotary die;

positioning the die in operable engagement with the frame; and

removing the die support.

19. The method of claim 18 wherein positioning the conveyor further comprises:

positioning the conveyor between at least two of the columns to intersect to the first axis of movement.

20. The method of claim 18 wherein moving the rotary die along the second axis of movement further comprises:

positioning the die in a die shuttle operably engaged with the conveyor.

21. The method of claim 18 wherein supporting the die further comprises:

attaching a support strap to the frame and the die to support the weight of the die.

22. The method of claim 21 further comprising:

attaching the support strap to the cross member of the frame.

23. The method of claim 18 wherein supporting the die further comprises:

attaching a support strap to the die and tensioning the strap to support the weight of the die.

24. The method of claim 18 wherein positioning the die further comprises:

moving the die along the first axis of movement.

25. The method of claim 24 wherein moving the die along the first axis of movement further comprises:

attaching a support strap to the cross member of the frame and the die.

26. The method of claim 25 further comprises:

moving the cross member along the first axis of movement to operably engage the die with the frame.

27. The method of claim 26 further comprising:

operably engaging the die with a modular die support permitting free rotation of the die about an axis of rotation, the bearing removably mounted to the frame.

28. The method of claim 25 wherein moving the die along the first axis of movement further comprises:

adjusting a length of the strap through a tensioning member on the strap to operably engage the die with the frame.

29. A method of removing a rotary die from a die apparatus, the method comprising:

supporting a rotary die operably positioned in a frame between a base and a cross member separated by a plurality of columns, the columns defining a first axis of movement;

positioning a die conveyor between the base and the cross member, the conveyor defining a second axis of movement;

engaging the die with the conveyor; and

moving the die along the second axis of movement away from the frame.

30. The method of claim 29 wherein supporting the rotary die further comprises:

moving the die along the first axis of movement to operably disengage the die from the frame.

31. The method of claim 30 further comprises:

attaching a support strap to the cross member and the die.

32. The method of claim 31 further comprises:

moving the cross member along the first axis of movement to move the die along the first axis.

33. The method of claim 31 further comprises:

adjusting a length of the strap through a tensioning member on the strap to move the die along the first axis of movement.

34. The method of claim 29 wherein positioning the die conveyor further comprises:

placing the die conveyor between at least two of the columns to intersect the first axis of movement.

35. The method of claim 29 wherein engaging the die with the conveyor further comprises:

placing the die in operable engagement with a die shuttle, the shuttle operably engaged with the conveyor.